



Waste Treatment Plant Project Overview & Technology

*“Our Country’s Largest
Chemical Plant”*

Presented by:

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WTP - Research and Technology

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Office of River Protection



Bechtel National, Inc.



Washington Group
International

Who is Involved?

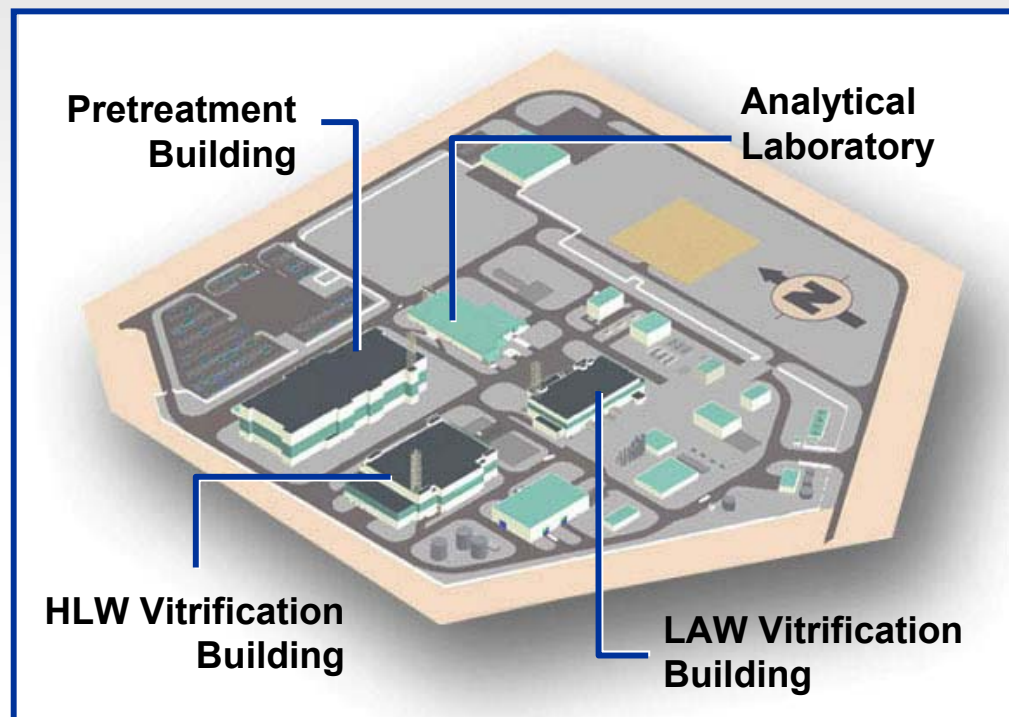
- Customer:
 - DOE – Office of River Protection (DOE-ORP).
- Two Major Contractors:
 - Bechtel National Inc. (BNI).
 - Washington Group International (WGI).
- Research and Technology
 - Battelle Pacific Northwest
 - Savannah River National Lab
 - Duratek/Catholic University

WTP: The Cornerstone of Hanford Cleanup

Hanford's Waste Treatment Plant will be the world's largest chemical-radioactive plant

Five Main Areas

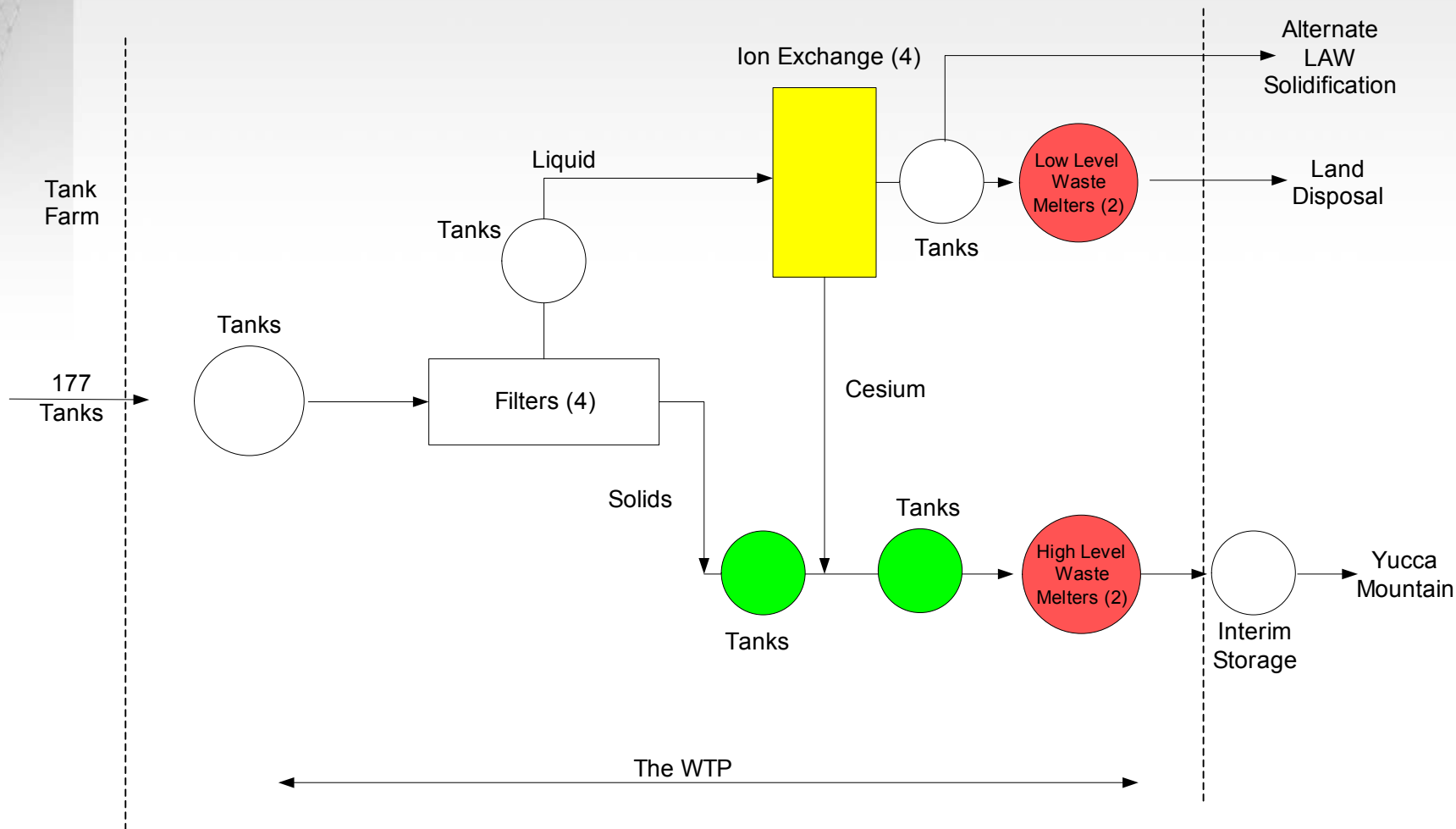
- Pretreatment (PT) Facility
- Low Activity Waste (LAW) Vitrification Facility
- High Level Waste (HLW) Vitrification Facility
- Analytical Laboratory
- Balance of Facilities



Plant's Objective

- To Process and Convert the Cold War Legacy Waste (53M gallons) to Glass.
- High Level Radioactive Glass to Yucca Mountain.
- Low Level Radioactive Glass to Hanford Integrated Disposal Facility
- Do it Safely!

WTP Plant Flow Sheet (very abbreviated)



WTP Performance – Engineering 71% Complete



Quantity	Released to Date	Planned Total	900MW Nuclear Power Plant
Concrete – CY	163,851	253,309	156,000
Structural Steel – TON	13,358	24,953	
Piping – LF	394,537	982,012	207,500
Conduit – LF	237,754	1,040,314	223,000
Cable Tray – LF	21,329	109,737	38,000
Cable – LF	198,203	4,865,130	
HVAC Duct – LB	767,386	3,509,510	

As of August 2004

WTP Performance - Construction 32% Complete



Quantity	Installed to Date	Planned Total	900MW Nuclear Power Plant
Concrete – CY	115,577	253,309	156,000
Structural Steel – TON	1,348	24,953	
Piping – LF	90,532	982,012	207,500
Conduit – LF	169,784	1,040,314	223,000
Cable Tray – LF	1,546	109,737	38,000
Cable – LF	36,596	4,865,130	
HVAC Duct – LB	129,903	3,509,510	

As of August 2004



January 2002 Aerial Photo of WTP Project Construction Site.



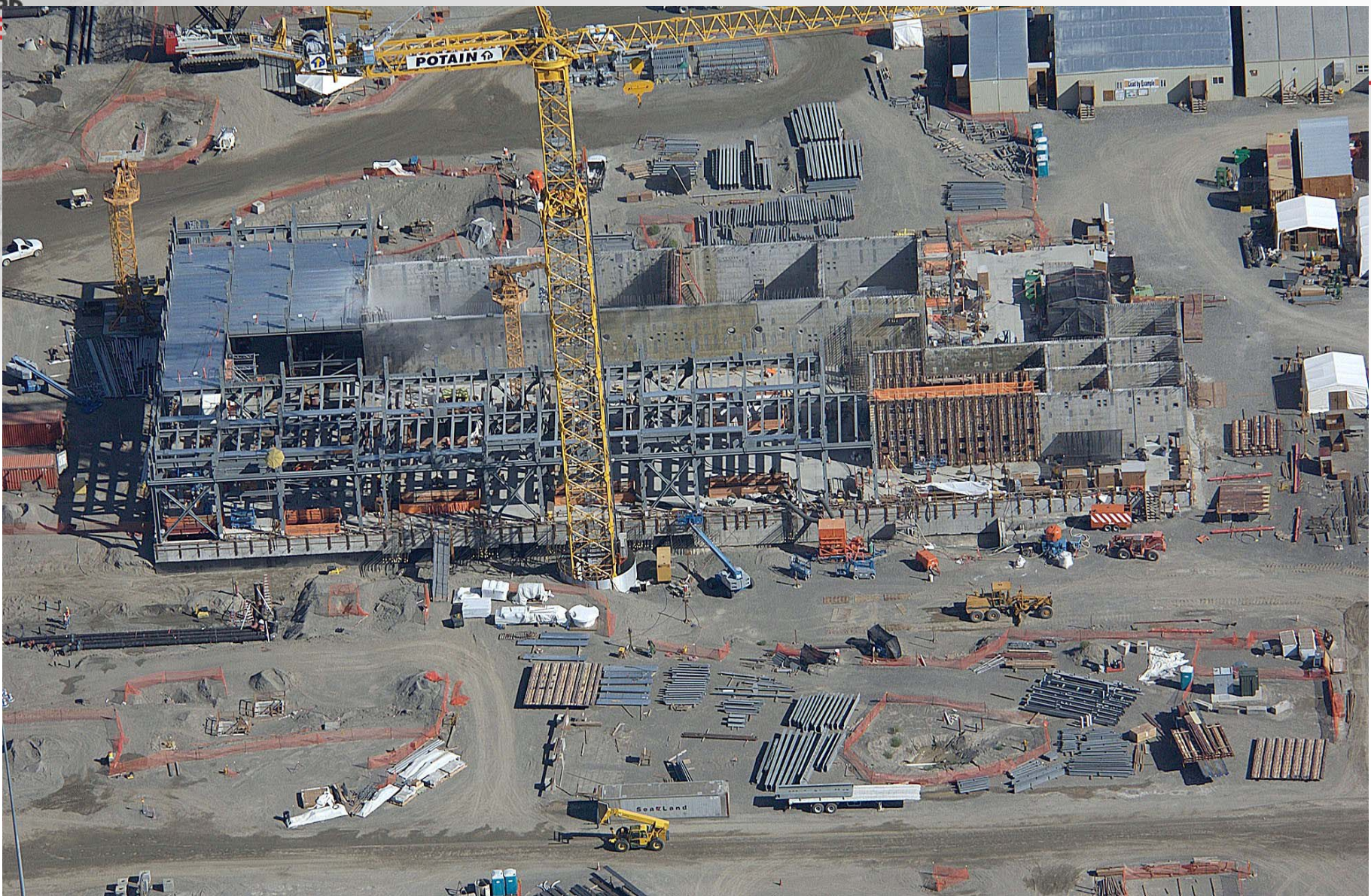
March 2004 Aerial View of the Waste Treatment Plant Construction site.



Aerial Shot of the Pretreatment Facility, Taken in August 2004.



Aerial Shot of the High-Level Waste Vitrification Facility, Taken in August 2004.



Aerial Shot of the Low-Activity Waste Vitrification Facility,
Taken in August 2004.

Project Summary

Where Are We?

Where Are We Headed?

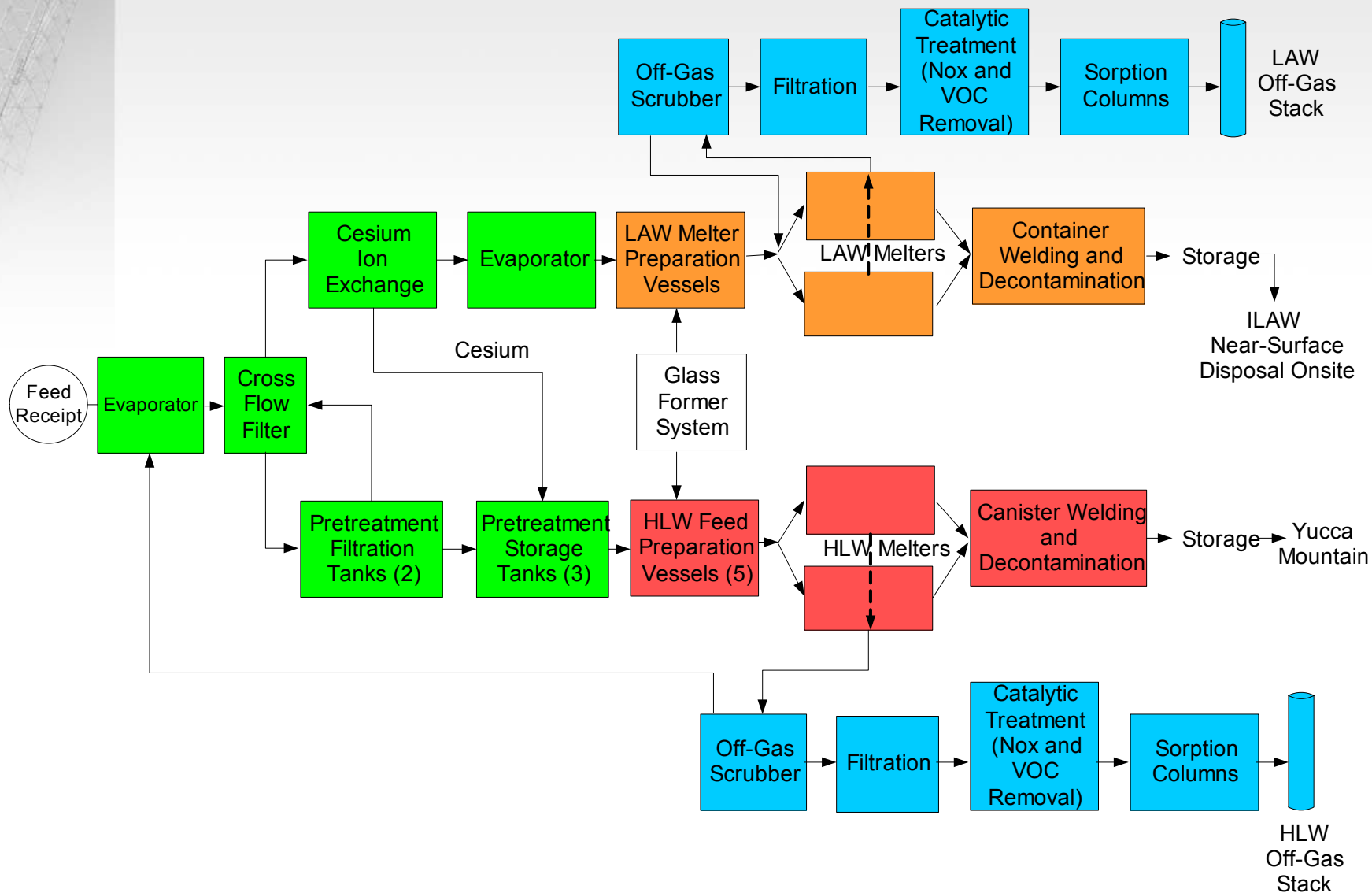
- Design 70%+ Complete.
- Construction 30%+ Complete.
- Initial Plant Testing: 2007.
- Water Runs: 2008.
- Simulant Testing: 2009.
- Radioactive Processing: 2010-2011.
- Turnover to Operating Contractors: 7/11.

Technology

And

Testing

Flowsheet



Waste Treatment Plant Project

- Proof of Process Testing Largely Complete
 - Evaporation
 - Wash/Leach
 - Filtration
 - Ion Exchange
 - Mixing/Gas Release
 - Stream Interactions
 - Melter Operation
 - Off-gas Operations
 - LAW and HLW Waste Form Development

- Analytical Methods - Underway

Waste Treatment Plant Project

Significant Technology Development Effort in Several Areas:

- Ion Exchange Material for Cesium.
- Mixing Systems for Non-Newtonian Slurry.
- Vitrification System and Size.

Ion Exchange

- Focus on Cesium
- Demonstrate Chemical and Physical Performance

Form	Material	Status
Granular	SuperLig 644	Complete
Spherical	Resorcinol Formaldehyde	Underway



SuperLig Ion Exchange Resin Shards



RF Ion Exchange Resin Beads

Mixing & Gas Release - Non-Newtonian Fluids

- Non-Newtonian Fluids Require a Force to be Exerted (Ketchup!) to Create Flow.
- Challenge: Develop Mixing System that Will Last 40 Years With NO Maintenance.
- System must Mix Tanks and Release Hydrogen Gas.

Status

- Complete: Hydraulic (Fluidic) Pumps and Air Spargers.



Vitrification (Glass Manufacture)



WTP - LAW

RPP-LAW 10 m²

**LAW Pilot
3.3 m²**

**DWPF
2.6 m²**

**Savannah
River
Defense
Waste
Process
Facility**

**West Valley
2.2 m²**

WTP - HLW

RPP-HLW 3.75 m²

**HLW Pilot
DM-1200
1.2 m²**



First High Level Canister Filled at Plant Rates and Conditions





Waste Treatment Plant - Science Needs

- Focus on Process Chemistry
(Equipment is fixed)

- Operations Enhancements
 - Increase Throughput
 - Waste Minimization

Waste Treatment Plant - Science Needs

- Leaching Chemistry
 - Aluminum
 - Chrome
- Chemical & Thermodynamic Data Validating Process Models
- Filtration Rate
- Ion Exchange
 - Capacity/Selectivity/Durability
 - Higher Temperature Performance
- Rheology Modifiers
- Waste Loading in Glass
- Hydrogen Management